testing

jesper fischer ehmsen

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Loading the data and defining the contrast:

```r
experiment2 = prep_data(file.path("data", 'STGI_exp2_compiled-data.csv'))
```

```
## [1] "Non responders: 3/40"
```

```
## Automatically converting the following non-factors to factors: quality, condition
```

```
## Automatically converting the following non-factors to factors: condition
```

```r
df_long_exp2 = experiment2$df_long %>% mutate(cold_probe = as.factor(cold_probe), manipulation = as.fac
## Define constrats such that we both get within / across (i.e. distal & proximal vs rostral & caudual)
levels(df_long_exp2$cold_probe)
```

```
## [1] "caudal"   "distal"   "proximal" "rostral"
```

```r
# "caudal"   "distal"   "proximal" "rostral"

#within - across
within_across = c(-1/2,1/2,1/2,-1/2)
#caudal - rostral
caudal_rostral = c(1,0,0,-1)
#distral - proximal
proximal_distal = c(0,-1,1,0)

#define the matrix
cold = rbind(1/4,within_across,caudal_rostral,proximal_distal)

#solve it
cold = solve(cold)
```

looking at just one subject and modeling it with a normal linear regression. First my way

```r
df_long_exp1_cold = df_long_exp2 %>% filter(quality == 'cold') %>% filter(ID == 45)

model_cold_exp = lm(beta ~ manipulation * cold_probe,
                    data = df_long_exp1_cold,
                    na.action = na.omit,
                    contrasts=list(cold_probe = cold)
                    )
tab_model(model_cold_exp, digits = 4)
```

```
## Model matrix is rank deficient. Parameters 'cold_probe,
##   manipulationTGI:cold_probe' were not estimable.
```

beta

Predictors

Estimates

CI

p

(Intercept)

0.0223

-0.0085 − 0.0531

0.154

manipulation [TGI]

0.2164

0.1729 − 0.2599

<0.001

cold probe[within_across]

0.0237

-0.0379 − 0.0852

0.446

cold probe[caudal_rostral]

0.0098

-0.0773 − 0.0968

0.824

cold probe[proximal_distal]

-0.0050

-0.0921 − 0.0820

0.909

manipulation [TGI] * coldprobe [within_across]

0.0592

-0.0279 − 0.1462

0.180

manipulation [TGI] * coldprobe [caudal_rostral]

-0.1706

-0.2937 − -0.0475

0.007

manipulation [TGI] * coldprobe [proximal_distal]

0.0390

-0.0841 – 0.1620

0.531

Observations

96

R2 / R2 adjusted

0.576 / 0.542

The interaction between TGI and Within / across is here $\beta = 0.0592$ p $= 0.180$

Then the other way:

```
model_cold_exp1 = lm(beta ~ manipulation * cold_cond * condition,
                          data = df_long_exp1_cold,
                          na.action = na.omit
                          )

tab_model(model_cold_exp1, digits = 4)
```

beta

Predictors

Estimates

CI

p

(Intercept)

0.0056

-0.0560 – 0.0671

0.858

manipulation [TGI]

0.2721

0.1851 – 0.3592

<0.001

cold cond [prox_caud]

0.0098

-0.0773 – 0.0968

0.824

condition [within]

0.0311

-0.0560 – 0.1181

0.480

manipulation [TGI] * coldcond [prox_caud]

-0.1706

-0.2937 – -0.0475

0.007

manipulation [TGI] *condition [within]

-0.0456

-0.1687 – 0.0775

0.464

cold cond [prox_caud] *condition [within]

-0.0148

-0.1379 – 0.1083

0.812

(manipulation [TGI] *cold cond [prox_caud])* condition [within]

0.2096

0.0355 – 0.3836

0.019

Observations

96

R2 / R2 adjusted

0.576 / 0.542

here the interaction between TGI and Within / across is β = -0.0456 p = 0.464

The difference seems to be the following:

if we group by the three conditions and then take only take the reference level for the cold_condition i.e. dist_rostr and then compute the difference in manipulation (control / TGI) across the difference in condition (within / across) (i.e the manipulation * condition interaction), we get the estimate from the second model i.e. -0.0456

```
df_long_exp1_cold %>% group_by(manipulation,condition, cold_cond) %>%
  summarize(mean = mean(beta)) %>% filter(cold_cond == "dist_rostr") %>% mutate(cold_cond = NULL) %>%
  pivot_wider(names_from = c(condition,manipulation), values_from = mean) %>%
  mutate(dif_cnt = within_CNT-across_CNT,
         dif_TGI = within_TGI-across_TGI) %>%
  mutate(dif_dif = dif_TGI-dif_cnt) %>% .$dif_dif
```

```
## 'summarise()' has grouped output by 'manipulation', 'condition'. You can
## override using the '.groups' argument.
```

```
## [1] -0.04560261
```

If we on the other hand just group by manipulation and condition i.e. not filtering by dist_rostr we get the second estimate i.e. 0.0592

```r
df_long_exp1_cold %>% group_by(manipulation,condition) %>%
  summarize(mean = mean(beta)) %>%
  pivot_wider(names_from = c(condition,manipulation), values_from = mean) %>%
  mutate(dif_cnt = within_CNT-across_CNT,dif_TGI = within_TGI-across_TGI) %>%
  mutate(dif_dif = dif_TGI-dif_cnt) %>% .$dif_dif
```

```
## `summarise()` has grouped output by 'manipulation'. You can override using the
## `.groups` argument.
```

```
## [1] 0.05917481
```

One can also double check this with a model that only contained the manipulation and condition as factors:

```r
model_cold_exp2 = lm(beta ~ manipulation * condition,
                     data = df_long_exp1_cold,
                     na.action = na.omit
                     )
summary(model_cold_exp2)
```

```
##
## Call:
## lm(formula = beta ~ manipulation * condition, data = df_long_exp1_cold,
##     na.action = na.omit)
##
## Residuals:
##       Min       1Q    Median       3Q       Max
## -0.280130 -0.034134 -0.008109  0.025380  0.285016
##
## Coefficients:
##                              Estimate Std. Error t value Pr(>|t|)
## (Intercept)                   0.01045    0.02307   0.453    0.652
## manipulationTGI               0.18682    0.03263   5.725 1.29e-07 ***
## conditionwithin               0.02368    0.03263   0.726    0.470
## manipulationTGI:conditionwithin  0.05917    0.04615   1.282    0.203
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.113 on 92 degrees of freedom
## Multiple R-squared:  0.5078, Adjusted R-squared:  0.4918
## F-statistic: 31.64 on 3 and 92 DF,  p-value: 3.812e-14
```

```r
tab_model(model_cold_exp2, digits = 4)
```

beta

Predictors

Estimates

CI

p

	Estimates	CI	p
(Intercept)	0.0105	-0.0354 – 0.0563	0.652
manipulation [TGI]	0.1868	0.1220 – 0.2516	<0.001
condition [within]	0.0237	-0.0411 – 0.0885	0.470
manipulation [TGI] *condition [within]	0.0592	-0.0325 – 0.1508	0.203
Observations	96		
R2 / R2 adjusted	0.508 / 0.492		